

## CIVIL AERONAUTICS BOARD

## AIRCRAFT ACCIDENT REPORT

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BEECHCRAFT TRAVEL AIR, N 819B  
NEAR LITTLE ROCK, ARKANSAS, JULY 22, 1958SYNOPSIS

A Beechcraft Travel Air, model 95, N 819B, owned by the Central Flying Service, Inc., Little Rock, Arkansas, spun to the ground twenty-five miles northwest of Little Rock, Arkansas, July 22, 1958, killing all four occupants. There was no fire.

Takeoff was from Adams Field, Little Rock Municipal Airport, Arkansas, about 11:00 a. m. with four men on board: Willis D. Hill, General Operations Safety Inspector, Civil Aeronautics Administration; James H. McClellan, a pilot who was to be flight checked for a twin-engine type rating; and two passengers, Howard K. Gilbert and Jesse T. Williams. The check flight was to consist of various flight maneuvers such as takeoffs, landings, stalls, simulated engine-out emergency procedure, and single-engine operation.

This model aircraft is four-place, equipped with two 180 h p engines and full-feathering propellers, and was type certificated by the Civil Aeronautics Administration. The aircraft was relatively new, had been properly maintained, and was in good operating condition in all respects.

Subsequent to the accident the Board had the Beech Aircraft Corporation conduct a test program in which spins simulating the conditions of the accident, and spins under even more critical conditions, were demonstrated. Recoveries from these spins, which included those with a windmilling inside engine and a feathered outside engine, and a windmilling inside engine with power being developed by the outside engine, were satisfactory and well within the spin requirements of CAR 3.124. However, these spin tests did demonstrate that if the spin was entered at 1,000-1,200 feet altitude complete recovery was not possible.

Witness opinion as to the altitude from which the spin started varied considerably and cannot be fixed closer than between 800 to 2,000 feet.

Investigation

Pilot McClellan held a valid airman certificate with commercial and single-engine land ratings and a current medical certificate. He was relatively inexperienced in light twin-engine aircraft; evidence indicates that his piloting time in

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1/ The term CAA (Civil Aeronautics Administration) rather than FAA (Federal Aviation Agency) is used herein because this accident occurred prior to December 31, 1958.

such aircraft was 10 hours, of which 5 hours was in the Beech Model 95. His total piloting time in various types of single-engine aircraft was listed as 1,500 hours on the CAA application form for multiengine rating.

CAA Inspector Hill had logged 5,341 flying hours but had done an unknown amount of other, and unlogged, piloting. To qualify for giving "light twin" engine rating flight checks, Hill had completed the Civil Aeronautics Administration's "light twin" checkout program in September 1956. During this course he flew the Piper Apache three hours, and the Cessna 310 two hours. On November 13, 1956, he completed a second course at the Civil Aeronautics Administration Aeronautical Center in Oklahoma City, Oklahoma, entitled "Aircraft Characteristics and Performance Below 12,500 Pounds." During this course he flew the Piper Apache 7 hours and 10 minutes, the Cessna 310, 8 hours and 10 minutes, and the Beechcraft C-18 one hour. Hill had given 18 multiengine flight checks since he had completed this course, of which five were in the 60 days immediately preceding the accident. The Beechcraft Travel Air, model 95, with a maximum weight of 4,000 pounds, is classed as a light twin. Hill had about 440 multiengine flying hours, but no recorded time in this model aircraft.

Passengers Gilbert and Williams, who were occupying the two rear seats, were both pilots. Their riding during the check flight was not contrary to regulation. They were aboard for familiarization with the check flight as one of them was shortly to take a similar test and the other was being indoctrinated as a CAA flight test designee.

Prior to takeoff Inspector Hill briefed Pilot McClellan on the forthcoming flight. This briefing included a discussion of a number of items in the operator's manual and in the aircraft flight manual. It included other factors such as the best rate-of-climb speed, the best angle-of-climb speed, and single-engine minimum-control speed. There was testimony indicating that this briefing lasted for approximately one hour.

The flight called the control tower for taxi instructions at 1054 and was cleared to runway 35. After reaching the runup area both engines were run up. At approximately 1102<sup>2</sup>/ the aircraft took off, flew the traffic pattern, and landed. Immediately thereafter, clearance for a second takeoff on runway 35 was requested and granted; the aircraft then took off and departed the Adams Field traffic pattern at approximately 1109.

The aircraft was observed by several witnesses shortly before 1200 some nine miles west of Mayflower, Arkansas. None had any aeronautical experience and they gave varying versions as to the altitude and attitude of the aircraft. They agreed, however, that the airplane nosed down and started spinning. Two witnesses said that the aircraft spun to the right; five said it spun to the left. Two witnesses observed the aircraft strike the ground and stated it spun until ground contact. They also stated that the tail bounced up and then fell back down. The other witnesses were unable to see the aircraft strike the ground, due to obstructions, but all heard the impact. The witnesses stated, in substance, that they heard the sound of the engine or engines running at reduced power until the aircraft struck the ground. There was some testimony that the engine noise increased just before impact. The altitude at which the spin started appears to have

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<sup>2</sup>/ All times herein are central standard based on the 24-hour clock.

been between 800, and 2,000 feet as estimated by these lay witnesses. In addition, two pilots who flew over the wreckage approximately thirty minutes after the accident testified that the ceiling was about 2,500 feet with broken clouds and visibility was between 10 and 12 miles. These conditions were substantially similar to those indicated by the Little Rock 1200 c. s. t. official U. S. Weather Bureau report except for broken clouds at 6,000 feet in the Little Rock area.

The statement of Pilot Richard M. Lieberman, who flew N 819B on the flight immediately preceding the accident, indicates that he visually checked the main fuel tanks and noted they were filled to capacity. The fuel gauge in the cockpit indicated that the auxiliary tanks were also full at this time. Mr. Lieberman's flight lasted .85 hours, after which the aircraft was serviced with 19.9 gallons of gasoline. Since the aircraft should use approximately 19.9 gallons of fuel for a flight of this duration, it is indicated that all tanks were full when Messrs. McClellan and Hill took off.

The gross weight of the aircraft at takeoff was approximately 4,000 pounds, or the maximum allowable gross takeoff weight. The center of gravity was located within the allowable limits, approximately 1.3 inches forward of the rearward limit.

The crash site was a cornfield on a flat river-bottom land, soft from recent rains. The airplane had contacted the ground in a slightly nose-low attitude while descending nearly vertically. There was evidence of some forward motion and some motion to the right; however, the predominant direction of movement was downward. The aircraft initially struck the ground on a heading of 127 degrees magnetic, and then, except for the empennage, pivoted counterclockwise on the right engine to a heading of 108 degrees. The empennage which was torn almost free came to rest on a heading of 080 degrees. The wreckage was not scattered, showing the predominant vertical motion at impact.

Attesting to the left spinning movement, the force of the impact threw the body of the check pilot, who occupied the right front seat, to the right and to a position outside the cabin and adjacent to the right engine. The body of the passenger in the right rear seat was also thrown to the right and to a position on the right wing near the tip. The bodies of the pilot, who occupied the left front seat, and the passenger, who occupied the left rear seat, were found in the wreckage, but to the right of their respective seats.

Except for the tail surfaces the entire aircraft was extensively damaged by the severe ground impact. The nose section was crushed and bent upward approximately 20 degrees and the entire lower fuselage area was also badly crushed. Both wings were crushed and wrinkled and each engine was nearly broken from its nacelle by impact forces acting upward and to the right. The cabin overhead structure collapsed downward and slightly forward, and the cabin sides bowed outward. The seats were deformed slightly and torn partially loose by high downward loads.

Examination of the wreckage accounted for all parts of the aircraft and determined that none were lost in flight. All doors and external openings were closed at impact and the landing gear, flaps, and step were retracted. All control surface balance weights were still attached, and the control surfaces, hinges, and bearings showed no evidence of damage before impact.

The flight control systems were generally intact and showed no evidence of malfunction or failure prior to impact. No evidence of flutter, fire, explosion, midair collision, bird strike, sabotage, excessive corrosion, or fatigue failure was found.

Examination of the powerplants disclosed that both were extensively damaged by impact as indicated by the crushed undersection of the engines and the twisted propeller blades. There was no evidence of fire in or about the powerplants

The two powerplants were transported from the scene to the maintenance facilities of Central Flying Service, Inc , at Little Rock, where a complete teardown inspection was conducted under the supervision of a Civil Aeronautics Board investigator. The teardown inspection indicates that the crankshafts and bearings and associated drive gears were intact, adequately lubricated, and free of indications of operating distress. All cylinder assemblies were in place on the engines and their interiors contained no evidence of combustion chamber irregularities.

Examination also revealed that the pitch-changing mechanisms of the left propeller were positioned in low pitch or the power off position for the left propeller. The No. 1 blade of the right propeller was found disconnected from its pitch-changing unit and in the low pitch position due to impact. The propeller pitch-changing cylinder and the No. 2 blade were found in the feathered position. In this instance neither propeller was feathered at the time of impact. This was evident because when the right propeller was dug out of its crater, a large quantity of oil was observed around the failed pitch-changing cylinder. During constant-speed operation, the pitch-changing cylinder is full of oil. When feathering is selected, centrifugal force and spring action feather the blade and the oil in the cylinder drains back into the engine. Since there was a considerable amount of oil around the pitch-changing cylinder at impact, the propeller must have been in the constant speed range at the moment of impact. If the propeller had been feathered at the time of impact the large amount of oil would not have been present and also the cylinder and cap would have shown indications of bottoming by the oil transfer tube and spring assembly. There were no such indications of bottoming on the cylinder assembly.

Examination of all propeller blades revealed impact distortions consistent with a no-power condition, which is normal procedure for spin recovery in this aircraft

All rear mounted accessories remained in place on the engines. Both carburetors, which are mounted beneath the engines, were broken off at impact. Both throttle controls were damaged extensively and were broken off at impact. The positions of all other controls were consistent with a no-power configuration at the instant of impact. The throttle valves were free. The mixture controls of both carburetors were extensively damaged at impact and were both found in the full rich position.

A review of the maintenance records of the aircraft indicated that a 25-hour inspection was completed on May 27, 1958. In addition to this inspection, the oil was changed, battery checked, air filter cleaned, and the radio changed. The aircraft had accumulated 30.4 hours at the time of this maintenance work. On June 7, 1958, the right engine intake air temperature gauge was repaired after a pilot

complaint. There were no later logbook entries. Maintenance, in short, had been adequate and of high quality during the 87 02 hours total usage of the aircraft.

N 819B was equipped with a throw-over type of control wheel which permitted the aircraft to be flown from either the right or left front seats with operable pairs of rudder pedals available for both pilot and copilot. Examination of the broken throw-over wheel arm indicated that the wheel was positioned on the left side at impact. From persons who were at the scene very soon after the crash it was learned that none of the four safety belts was found fastened. With one exception none of the four safety belts exhibited signs of heavy loading as from impact. The exception was the rear left belt which appeared to have been cut during or after the impact. Examination at the accident scene of the belt webbings, anchor fittings, and the buckle assemblies also showed that these components were in good condition except for the webbing of one belt as described above.

The aircraft was equipped with a stall warning system which gave both aural and visual notice of approaching stall. Investigation disclosed that it was functioning properly during the previous flight a few hours before the accident. It should be noted, however, that in order to demonstrate minimum-control speed the aircraft normally has to fly in that speed range, which would activate the stall warning system.

Following the accident Beech Aircraft Corporation conducted certain spin tests in which a Civil Aeronautics Board representative participated, and confirmed the ability of the aircraft to recover readily from spins under the most adverse configurations. They show that under the existing loading a minimum of 1,200 feet is needed for recovery from a fully developed spin to either the left or to the right with wing flaps and landing gear up. Neither engine power nor the feathering of one propeller has any significant effect on spin recovery characteristics.

Civil Air Regulations prescribe dual controls for flight tests. Under these rules, the CAA inspector may accept the throw-over control wheel installation if he believes it satisfactory for a type rating test.

### Analysis

The exact maneuver that was being attempted at the time the spin started cannot be determined from physical evidence, but it may logically be deduced. Normally this type of check flight for rating lasts from an hour to an hour and a half. Maneuvers to be demonstrated to the satisfaction of the inspector are a simulated single-engine climb-out following a missed-approach, an engine failure on takeoff, and an engine failure at minimum-control speed. As the accident occurred after the check had been in progress for about an hour, and as these maneuvers are normally done toward the end of the flight, it seems entirely possible that one of these was in process when the spin started.

It is most unlikely that a spin was started at low altitude intentionally. Spins are not called for in either the testing for type certification of most twin-engine aircraft nor during check flights for type ratings. The Board is of the opinion the spin occurred unintentionally.

Examination of the wreckage indicated that the aircraft struck the ground in a left spin. The flight controls were capable of normal operation, the airplane was aerodynamically clean (flaps up, gear up, all openings closed), and no evidence of structural failure or deformation was found.

The spin-recovery characteristics of the aircraft are good so that any conventional spin-recovery technique results in a rapid stopping of the spin. Stopping the spin does, however, leave the aircraft in nearly a vertical dive since the spin is a normal nose-well-down spin. Recovery from this dive with flaps up and the loading which existed on N 819B would take from 1,000 to 1,500 feet of altitude.

If a spin or any other maneuver is entered which endangers the safety of the aircraft during a flight test, the CAA inspector customarily takes over the controls and recovers from the maneuver. The performance of this function is possible with the single throw-over control column. However, during the entry of a spin or its recovery, particularly at low altitude, the Board believes this function would be considerably more difficult.

When N 819B contacted the ground it was in approximately a 20-degree nose-low attitude with the left wing down and was moving slightly forward and to the right but primarily vertically downward. This indicates that a recovery had not been effected even though opposite rudder (right rudder deflection) control existed at impact. The nose-up attitude (relative to a normal spin) was in all probability caused by the pilot's last-second attempt to pull the nose up by up-elevator movement just before contacting the ground.

The Board is of the opinion that a stall and spin occurred at a low altitude during the demonstration of one of the engine-out minimum-control speed maneuvers. The Board is, however, unable to determine their reasons for entering the initial spin. Nevertheless, it believes that the following factors may have caused or contributed to the entry into the spin. The only experience that Inspector Hill had in this particular make and model aircraft was during the flight ending in the accident. During this time, about 1 hour, it is reasonable to believe that the applicant pilot did most of the flying. It appears that the inspector was not familiar with the handling and stalling characteristics of the airplane. During the performance of simulated engine-out maneuvers at minimum-control speed it is therefore possible that the aircraft reached a stall-spin airspeed condition before the inspector recognized it. In this condition, any mistaken handling of the powerplant or flight controls could lead to an unintentional spin.

The unbuckled condition of all four safety belts was considered unusual for a flight in which stalls and other change of attitude maneuvers were to be performed. Since there appears to be no logical reason for the occupants of the front seat to unfasten their safety belts during the flight, it must be presumed that the belts became unbuckled as a result of ground impact forces. The safety belts comply with existing standards for seat belts but these standards do not specifically require that a belt remain fastened under rebound conditions. To perform its intended function, however, a belt must maintain its integrity through any survivable impact condition. The extreme ground forces to which the occupants of N 819B were subjected were primarily downward into the seat and precluded survival even if the buckles had remained closed.

## Conclusions

The Board concludes that a factor in this accident may have been Inspector Hill's unfamiliarity with the Beech Model 95.

Civil Air Regulations permit the use of the throw-over control wheel for type rating flight checks in lieu of fully functioning dual controls when the Administrator has determined that fully functioning dual controls are not necessary. This determination is made by CAA inspectors when and after considering all factors, they are satisfied that the test can be conducted safely. The Board is of the opinion that in a flight check with this type aircraft a spin should not normally occur but that if a spin is inadvertently entered, recovery may be effected with a throw-over wheel positioned on either side of the cockpit provided there is sufficient altitude. However, the Board is of the opinion that on this particular flight fully functioning dual controls might have prevented the accident.

Aviation Safety Release No 405 was issued in June 1956 to combat a rising accident rate in light twin-engine aircraft operating on one engine. The release directed that an increased emphasis be placed on engine-out procedures and that examiners require that the applicants demonstrate satisfactory competence in flying the aircraft under these conditions. After the release of ASR 405 the accident rate trend reversed and has shown a steady decrease, attesting to the merit of this release. The Board recognizes that the proper demonstration of single-engine maneuvers necessitates the aircraft being flown at airspeeds bordering stall conditions. The Board recognizes also that there are advantages in performing the maneuvers as low as possible to most nearly simulate control and power conditions of an engine failure in the critical circumstance of takeoff and landing.

Following the accident, the CAA instructed their flight inspector and examiner personnel to provide, during flight tests in multiengine aircraft, sufficient altitude for safe recovery from inadvertent spins occurring during maneuvers conducted at minimum-control speeds, engine out.

## Probable Cause

The Board determines that the probable cause of this accident was the unintentional entry into a spin at too low an altitude to recover.

BY THE CIVIL AERONAUTICS BOARD

/s/ JAMES R. DURFEE

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ G. JOSEPH MINETTI

/s/ LOUIS J. HECTOR

## S U P P L E M E N T A L   D A T A

### Investigation and Hearing

The Civil Aeronautics Board was notified of this accident at 1605 e. s t., July 22, 1958. Although this accident is in the category the Board authorized CAA to investigate, under delegation of authority contained in Public Notice PN-7, the CAA requested that the Board assume responsibility for the investigation inasmuch as a relatively new model aircraft was involved. On July 23, 1958, the Board terminated that delegation as requested by the CAA, and directed that an investigation be made by the Board in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. Investigation was immediately initiated and a public hearing was held by the Board in Little Rock, Arkansas, on August 26-27, 1958.

### The Aircraft

N 819B Beech Model 95, was manufactured on May 7, 1958, with serial No. TD-117. The aircraft was bought from Beech Aircraft Company on May 10, 1958, by Central Flying Service, Inc., at Little Rock, Arkansas. Total aircraft time at date of accident was 87:02 hours.

Lycoming model O-360-A7A engines equipped with Hartzell model HC922K-2 propellers were installed in the aircraft. Time on each of the engines and propellers totalled approximately 87 hours since new.

### The Pilots

James H. McClellan, age 31, held airman certificate No. 1208765 with commercial pilot and airplane single-engine land ratings. His last second-class CAA medical examination was taken on July 22, 1958. He had a total flying time of 1,500 hours, of which five hours were in the subject aircraft, and a total of 10 hours in this airplane class.

Willis D. Hill, age 57, held airman certificate No. 63925 with airline transport, multiengine land and flight instructor ratings. He had logged a total of 5,341 flying hours, of which approximately 70 were in light twin-engine aircraft. His last CAA medical examination was accomplished August 1, 1957. His medical certificate showed a Class I lens restriction and a waiver for wearing lenses issued in 1948.